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Review of the Office of Air Quality Planning and Standard´s Lead Benefit Valuation Methodology

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The program's lack of clearly stated scientific assumptions and objectives, and its need for a more consistent approach to peer review, constitute its most serious technical deficiencies. The absence of consistently documented assumptions and objectives, and assessing whether the program as a whole, or specific studies, have achieved their overall goals.

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Washington, DC 20460

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June 1987

EPA

Report of the Clean Air Scientific Advisory Committee (CASAC)

Review of the Office of Air Quality Planning and Standard's Lead Benefit Valuation Methodology

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D C 20460

June 30, 1987

OFFICE OF
THE ADMINISTRATOR

The Honorable Lee M. Thomas
Administrator
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, DC 20460

Dear Mr. Thomas:

The Subcommittee on Lead Benefit Analysis of the Clean Air Scientific Advisory Committee (CASAC) has completed its review of the lead National Ambient Air Quality Standards benefit valuation methodology. This review, requested by the Office of Air Quality Planning and Standards, focused on the contractor prepared report entitled "Methodology for Valuing Health Risks of Ambient Lead Exposure" (Mathtech, Inc., 1986). The Subcommittee reviewed the report in terms of the valuation of changes in health endpoints, the uncertainty in the benefits estimates, and the appropriateness of the benefit category aggregation procedures.

The Subcommittee was impressed with the thorough presentations that were made by Agency and contractor staff at the public meeting on March 10, 1987. The proposed solutions presented were in response to specific written comments that the Subcommittee had prepared on the report prior to the meeting. Based on these presentations and the discussion at the meeting, the Subcommittee concludes that the revised document will provide a defensible presentation of the benefits that were analyzed. However, there are potentially substantial benefits that are currently excluded in the analysis. These include the likely relative magnitude of benefits for individuals in lead-base painted homes, and how fetal impacts (reduced birth weight and early developmental effects) and other benefit categories could be included in future assessments.

The Subcommittee also suggested modifications to benefit calculations that were included in the analysis, the presentation of uncertainty and omissions, and aggregation of benefits. The Subcommittee also made several recommendations concerning the exposure and risk assessments, although these were not the focus of this review and are being separately reviewed by CASAC.

Thank you for the opportunity to present our views on this component of the review of the lead National Ambient Air Quality Standards. We request that the Agency officially respond to the scientific advice contained in the attached report.

Sincerely,

Morton Lippmann
Chairman
Clean Air Scientific
Advisory Committee

Robert D. Rowe
Co-Chairman
Subcommittee on Lead
Benefit Analysis

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SAB-CASAC-87-032

Report of the
Clean Air Scientific Advisory Committee
Subcommittee on Lead Benefit Analysis

Review of the Environmental Protection Agency's Lead National Ambient Air Quality Standard Benefit Valuation Methodology Report

June 1987

Science Advisory Board
U.S. Environmental Protection Agency
Washington, D.C.

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1. EXECUTIVE SUMMARY

This is the report of the Lead Benefit Analysis Subcommittee of the Clean Air Scientific Advisory Committee (CASAC). The Subcommittee was formed at the request of the Office of Air Quality Planning and Standards (OAQPS) to review the lead national ambient air quality standards (NAAQS) benefit valuation methodology.

The Subcommittee reviewed the draft document entitled "Methodology for Valuing Health Risks of Ambient Lead Exposure" (Mathtech Report 2397-001, December 1986) and reached the following conclusions:

- Potentially Important Benefits Excluded - The current work provides an incomplete assessment of changes in benefits associated with alternative standards. Potentially significant population groups, health endpoints and damage categories are left unquantified due to data limitations. As a result, the benefits of alternative regulatory levels may be substantially understated. Techniques exist to quantify economic measures of value for several of the omitted benefits. OAQPS should specifically address the likely relative magnitude of benefits for individuals in lead-based homes, how fetal impacts might be included in future assessments, and how other benefit categories could be included in future assessments.

- Modifications to Included Benefit Calculations - The quantified benefits generally cover medical treatment costs and productivity losses incurred by the affected individual and/or family members (known as a "cost of illness" or "resource cost" valuation method) for selected health endpoints. With agreed upon modifications discussed below, this work will present defensible estimates of the economic measures of these damage categories.

- Presentation of Uncertainty and Omissions - The presentation of uncertainty and omissions in the analysis was insufficient. OAQPS should improve upon this presentation in terms of estimates of central tendencies, and the direction and relative importance of omissions and biases.

- Aggregation of Benefits - The aggregation of those benefits that are quantified is adequate, once corrections are made for discounting future benefits.

- Refinements to the Exposure and Risk Assessments - The Subcommittee recommends several modifications to the exposure and risk assessments to improve the defensibility and usability of this work.

2. INTRODUCTION

The NAAQS for lead is currently under review by both the Environmental Protection Agency and by CASAC. On May 13-15, 1986, CASAC last reviewed the Criteria Document and Staff Paper for lead, closing on the Criteria Document, and providing comments on the Staff Paper pending further review in late 1987. Since this review of the lead NAAQS may result in regulatory action, the Agency is preparing a Regulatory Impact Analysis (RIA) as required by Executive Order 12291. As part of this requirement, the Agency has prepared a lead benefit analysis. Although it is not clear at this time whether benefits will be considered in setting the NAAQS for lead, the benefit methodologies developed in the RIA will be useful in evaluating future regulatory actions such as New Source Performance Standards (NSPS) and State Implementation Plans (SIP).

In November 1986, OAQPS requested that CASAC establish a benefit analysis subcommittee to review the lead benefit methodology. In December 1986, the Subcommittee examined the draft document, "Methodology for Valuing Health Risks of Ambient Lead Exposure," and provided written comments which formed the basis for discussion at a public meeting held on March 10, 1987 in Washington, DC. At this meeting, OAQPS prepared a thorough presentation of proposed solutions to the problems that had been raised by subcommittee members in their written comments. Upon revision, the Subcommittee expects that the document will provide a defensible presentation of those benefits analyzed. However, there are potentially substantial benefits that are currently excluded in the analysis.

The charge to the Subcommittee included evaluation of:

- the valuation of changes in health endpoints,
- the presentation of the uncertainty in the benefits estimates, and
- the appropriateness of the benefit category aggregation procedures.

3. DISCUSSION

A. Potentially Important Benefits Excluded

The omitted benefits in the analysis may be very significant, resulting in quantified estimates providing only a lower bound on damages.

Important omitted physical and economic benefits include:

- Reduced Birth Weight and Early Developmental Effects - OAQPS cited the new body of literature assessed in the criteria document addendum on risks associated with *in utero* exposures

to lead. The Subcommittee provided abstracts from the September 8-12, 1986 Edinburgh Workshop on lead exposure and neurobehavioural effects in children and recommended that OAQPS investigate how these health impacts may be included in future analyses concerning lead standards.

- Benefits to Children in Lead-Base Painted Homes - The Subcommittee recognizes that the NAAQS for lead cannot be set to protect individuals in lead-base painted homes from any adverse health impacts caused by lead. However, any change in the regulation will nonetheless affect the total lead exposure burden of these individuals. A complete benefit analysis under E.O. 12291 should include all benefits of the regulation, including these individuals. The Subcommittee recommends that OAQPS undertake a cursory investigation of the potential importance of this benefit category relative to the benefits of the included population.

- Unquantified Benefits and Damages to Affected Individuals and Households - The current analysis of morbidity effects focuses upon treatment costs and productivity losses. This omits the potentially significant damages of discomfort, activity impacts, fear, etc. that would be included in a total value measure. Limited evidence suggests that these omitted damages may be important as well. In addition, it is possible that damages or benefits associated with mitigating or averting behavior are lost. Methods exist to quantify these benefits. The Subcommittee recommends that OAQPS utilize these methods in future assessments to more fully quantify damages.

- Socially Distributed Benefits - The analysis focuses upon the affected individual and households. In many cases, the possibility exists for broader social benefits from improvements in the health status of affected individuals. These might include societal benefit due to increased average IQ, reduced welfare, improved wellbeing of the affected individual and other benefit categories. Extremely limited research has been conducted on this issue, so that the magnitude of this omission is unknown. The Subcommittee recommends the Agency further consider methods to incorporate these benefits in future assessments.

B. Modifications to Included Benefit Calculations

OAQPS responded to the Subcommittee's review comments with many recommendations that will result in technically defensible benefit estimates for the included damage categories. These include:

- A discussion of the framework for valuing health risks, such as the Harrington and Portney work, and how the estimates undertaken relate to this framework. New modeling does not need to be undertaken, as sufficient work is documented in the existing literature.

- Using socioeconomic measures representative of the population living near the point source where possible, rather than the U.S. population characteristics.

- Estimating the value of damages for only those unscreened children who would be expected to be in high risk categories, where ultimately symptoms will occur resulting in the need for subsequent treatment. OAQPS should use the treatment costs and make the interpretation and limitations of this approach a caveat.

- Improving selected estimates and discussion concerning treatment and other response costs, such as deletion of repainting for those who do not live in lead-paint based homes, review of chelation costs, IQ educational cost differentials, and including valuing parental time related to treatment of children. The issue of what share of repainting cost should be borne attributable to atmospheric lead needs to be addressed.

- Using updated reviews concerning the value of a statistical life, and addressing the issue, at least through reference and caveats, of incremental life years rather than one value of life statistic as being potentially more appropriate.

C. Presentation of Uncertainty and Omissions

Several potentially important omissions occur, as discussed above. In addition, possible biases occur. The Subcommittee recommends improvements in assisting the reader to ascertain the relative direction of these effects on the results, and the relative importance on the benefit calculations. For example, omissions of discomfort and activity effects for those experiencing strokes are likely to be more important than many possible biases in some of the treatment cost estimates. The presentation of upper and lower bound estimates, while providing ranges of interest, obscure information about the central tendencies of quantified damages. Modifications are needed to address these issues and to present the results so that their relevance to policy decisions might be better understood.

D. Aggregation of Benefits

Benefits are presented in both physical units (strokes, lives lost, etc.) and economic units. The physical damages are best presented as incidences per time period and should not be aggregated. The economic

measures are appropriately aggregated, once discounted. Due to the long time lags involved in the analysis, discounting takes on a significant role. Accounting for time lags on impacts and the use of alternative discount rates were recommended as more appropriate for providing a sensitivity analysis of the results to this calculation.

E. Refinements to the Exposure and Risk Assessments

The exposure and risk assessments were not the focus of this review, since CASAC is reviewing these separately. However, several refinements that significantly impact on the defensibility and usability of these assessments in the economic analysis were identified by OAQPS staff. Most of these refinements are in progress or will be examined. These include:

- Making exposure estimates for individual census blocks or block groups, rather than census tracts.
- Investigating the application of point source specific Geometric Standard Deviations (GSD) rather than national averages.
- Using newly available studies on the relationships between erythrocyte protoporphyrin (EP) and blood lead to correct for iron status, which was not done in the earlier Piomelli erythrocyte protoporphyrin study.
- Making adjustments for erythrocyte protoporphyrin screening failure rate.